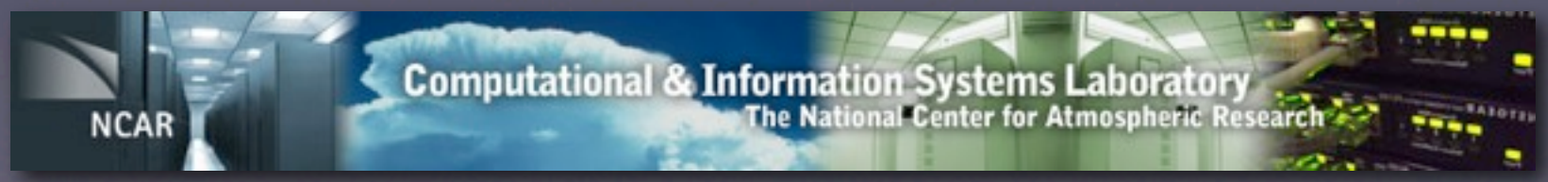
Development of Model Execution and Documentation Capabilities for the Earth System Grid

NOAA Global Interoperability Program (GIP) Workshop
GFDL, Princeton, NJ
November 4, 2009

Don Middleton & Luca Cinquini
National Center for Atmospheric Research
Computational and Information Systems Lab
Technology Development Division



Gateways for ESG, and more

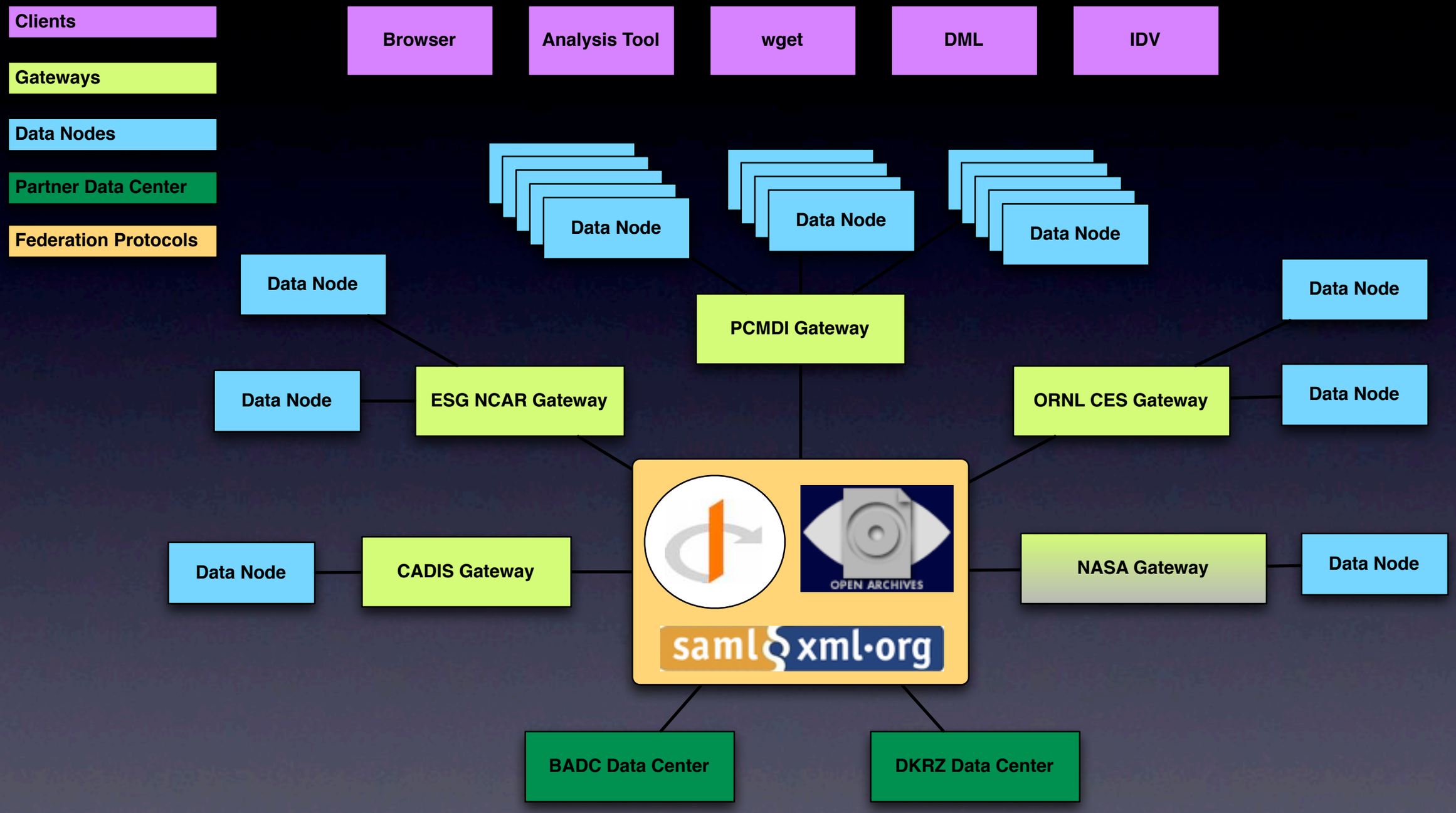


Diagram Courtesy of Luca Cinquini (NCAR)

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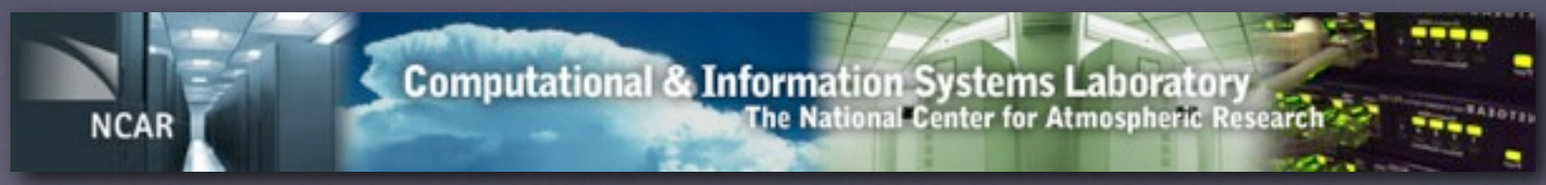
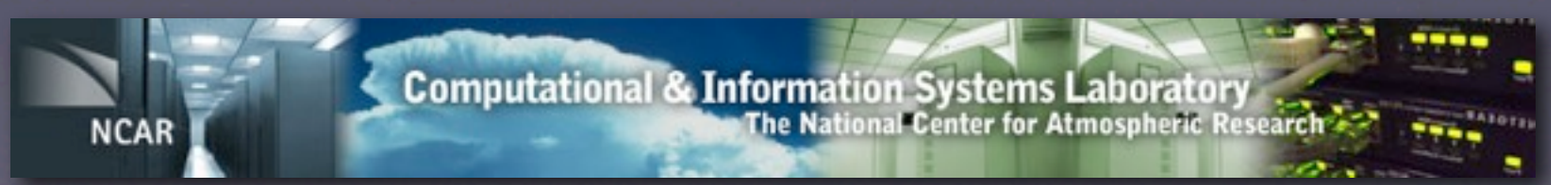


ESG Gateway (alpha)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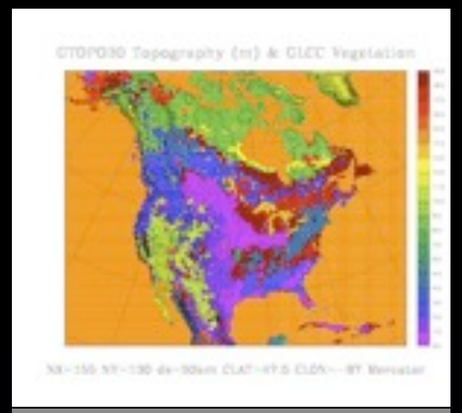
The Earth System Grid
(Climate/IPCC,
DOE+NSF)



NARCCAP
(Regional Climate:
NSF, DOE, NOAA)

Cooperative Arctic Data
and Information Service
(Polar, NSF)

NCAR's Community
Data Portal

Earth System Curator
(Models+Data, NSF)

TIGGE
(Ensemble weather)

NSF
TeraGrid

WMO-WIS
(Global Federation)

Science Gateway Framework (SGF, in development)

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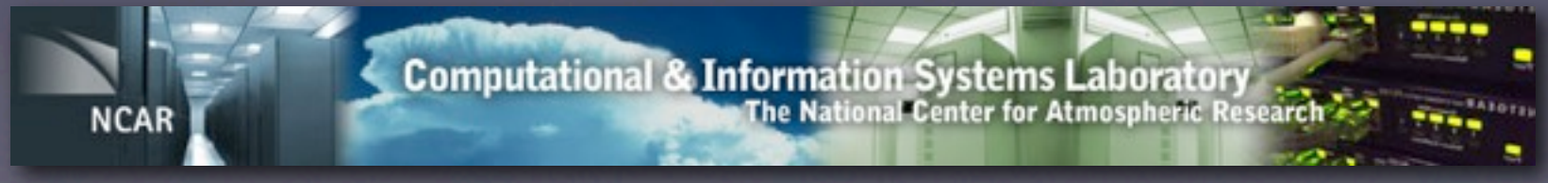
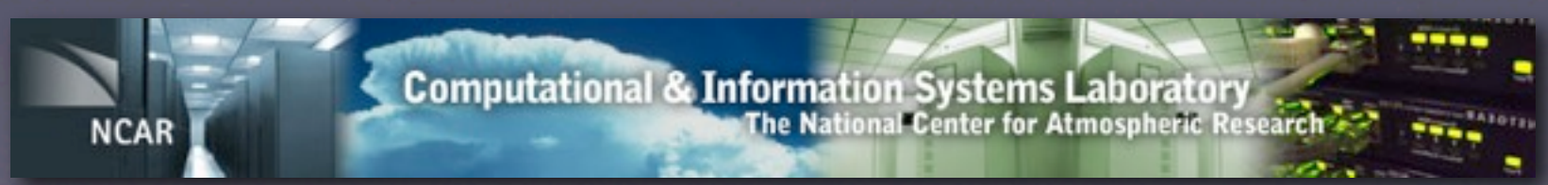


Information Integration Across Models, Data, and Knowledge



Information Integration Across Models, Data, and Knowledge

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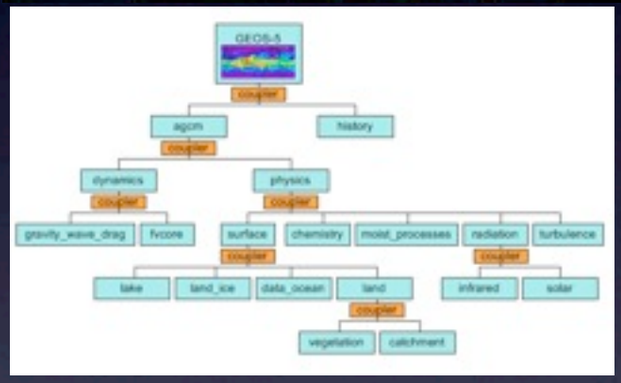
Information Integration Across Models, Data, and Knowledge

Earth System Curator

ESMF



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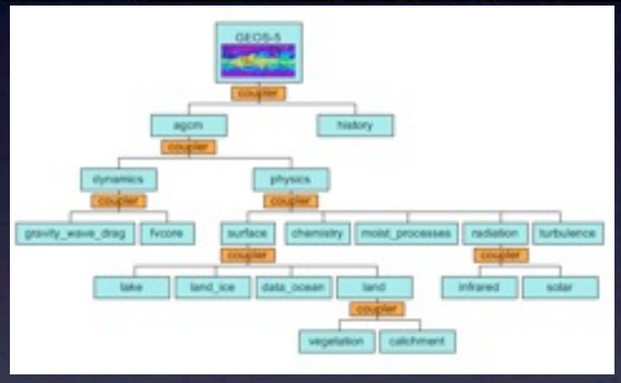
Information Integration Across Models, Data, and Knowledge

Earth System Curator

ESMF



Earth System Grid

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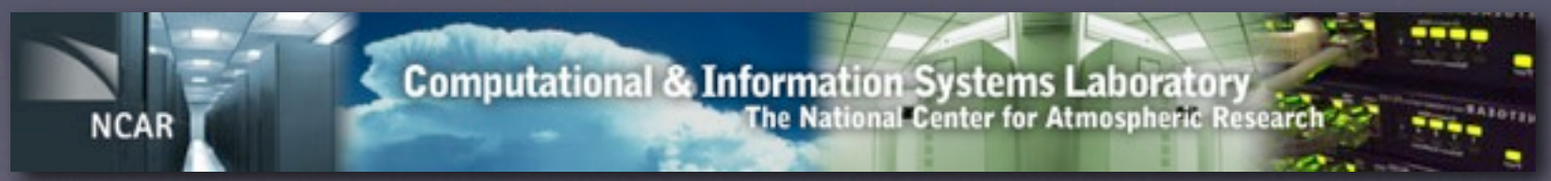

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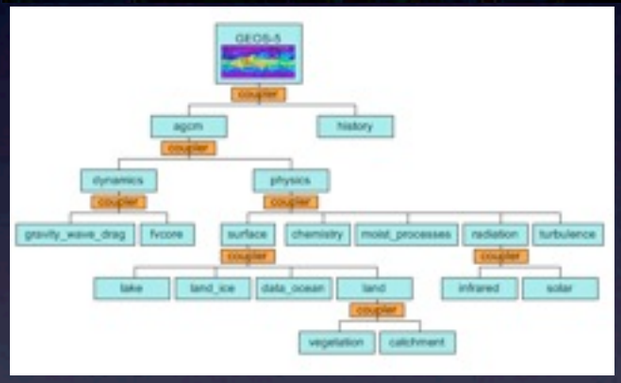
Information Integration Across Models, Data, and Knowledge

Earth System Curator

ESMF



metafor

Earth System Grid

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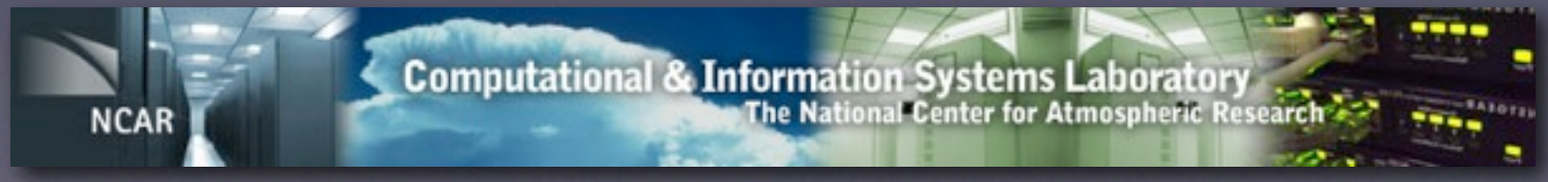

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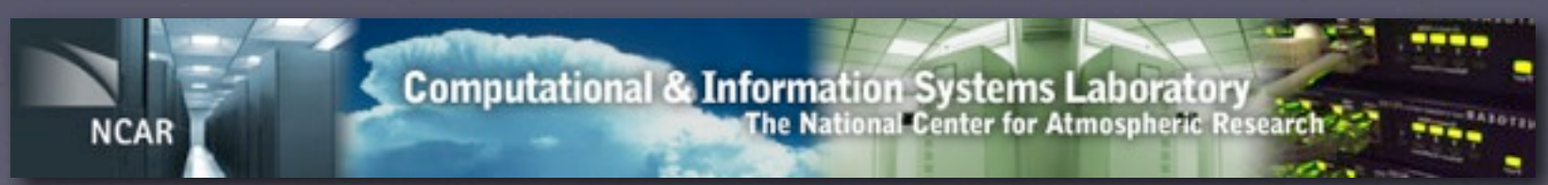
“Trackback” Interfaces

ESM2M Control-1990 dyn_veg warmbrdf Simulation
Full Name: Earth System Model Version 2 Modular Ocean Model 4 Dynamic Vegetation Warm Bidirectional Reflection Distribution Function
Description: Simulation to arrive at the initial conditions for CMIP5 Experiment 3.1

Properties | Components | Grids | Reference | Experiment

- ESM2M Control-1990 dyn_veg warmbrdf Simulation
  - Physical Domain: Earth system
  - Version: quebec
  - AM2 Control-1990 dyn_veg warmbrdf Simulation
    - Physical Domain: Atmosphere
    - Version: quebec
    - AM2 FV Dynamical Core Control-1990 dyn_veg warmbrdf Simulation
      - Physical Domain: Atmosphere
      - Version: quebec
    - Atmospheric Chemistry Control-1990 dyn_veg warmbrdf Simulation
      - Physical Domain: Atmosphere
      - Version: quebec
  - LM2 Control-1990 dyn_veg warmbrdf Simulation
  - MOM4 Control-1990 dyn_veg warmbrdf Simulation
  - SIS Control-1990 dyn_veg warmbrdf Simulation
    - Physical Domain: Ice
    - Version: quebec
  - TOPAZ Control-1990 dyn_veg warmbrdf Simulation
    - Physical Domain: Ocean
    - Version: quebec



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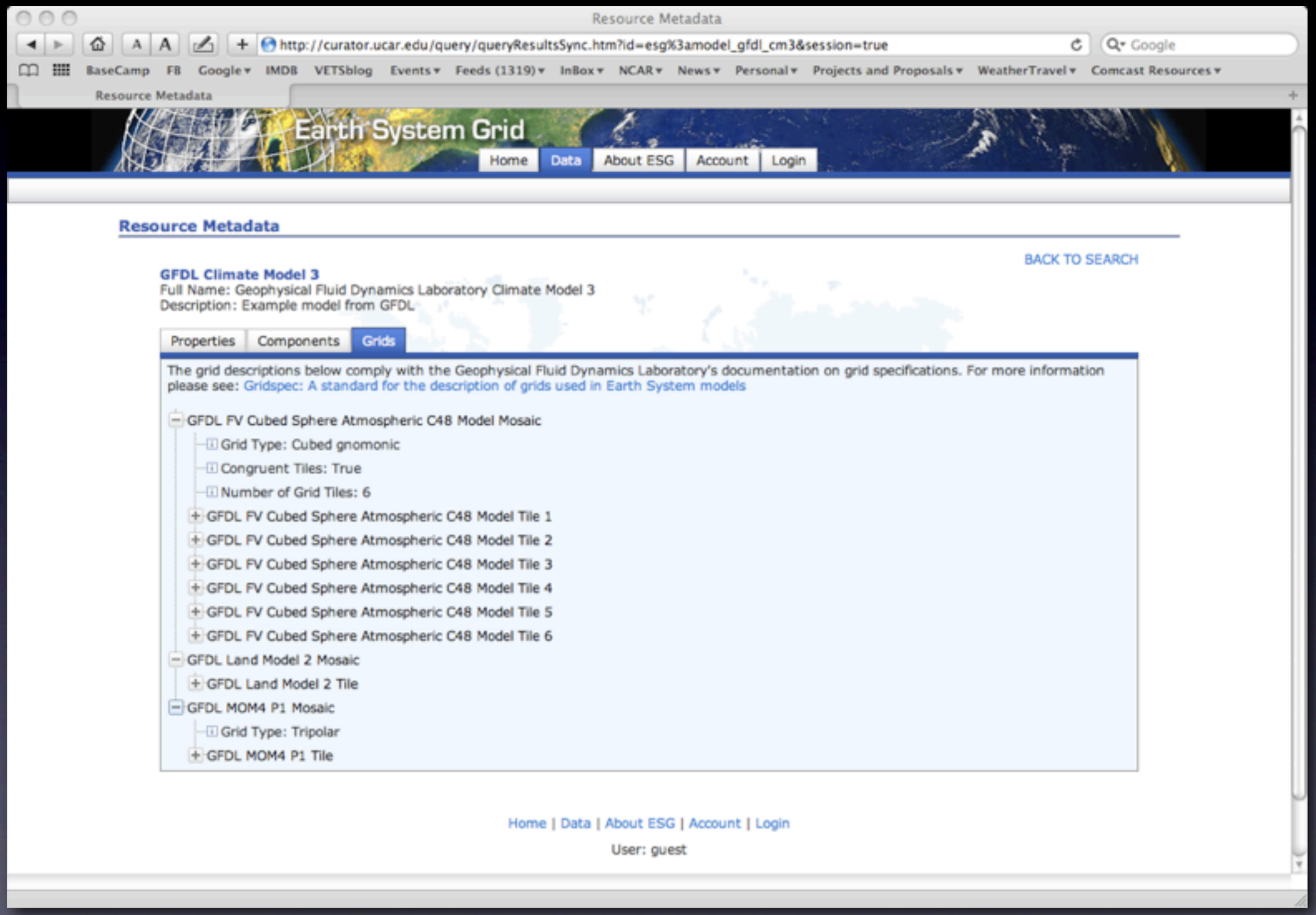
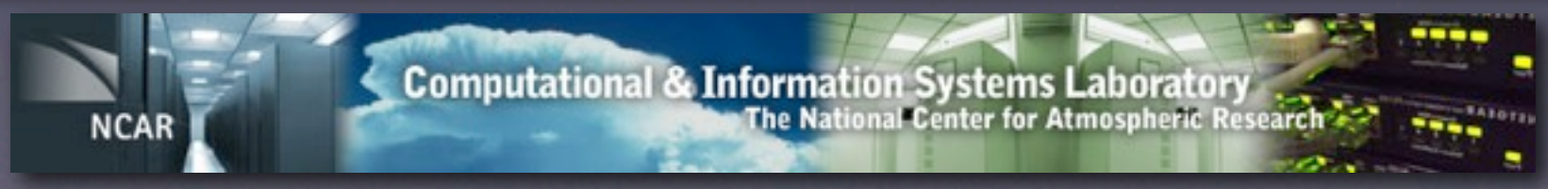
“Trackback” Interfaces





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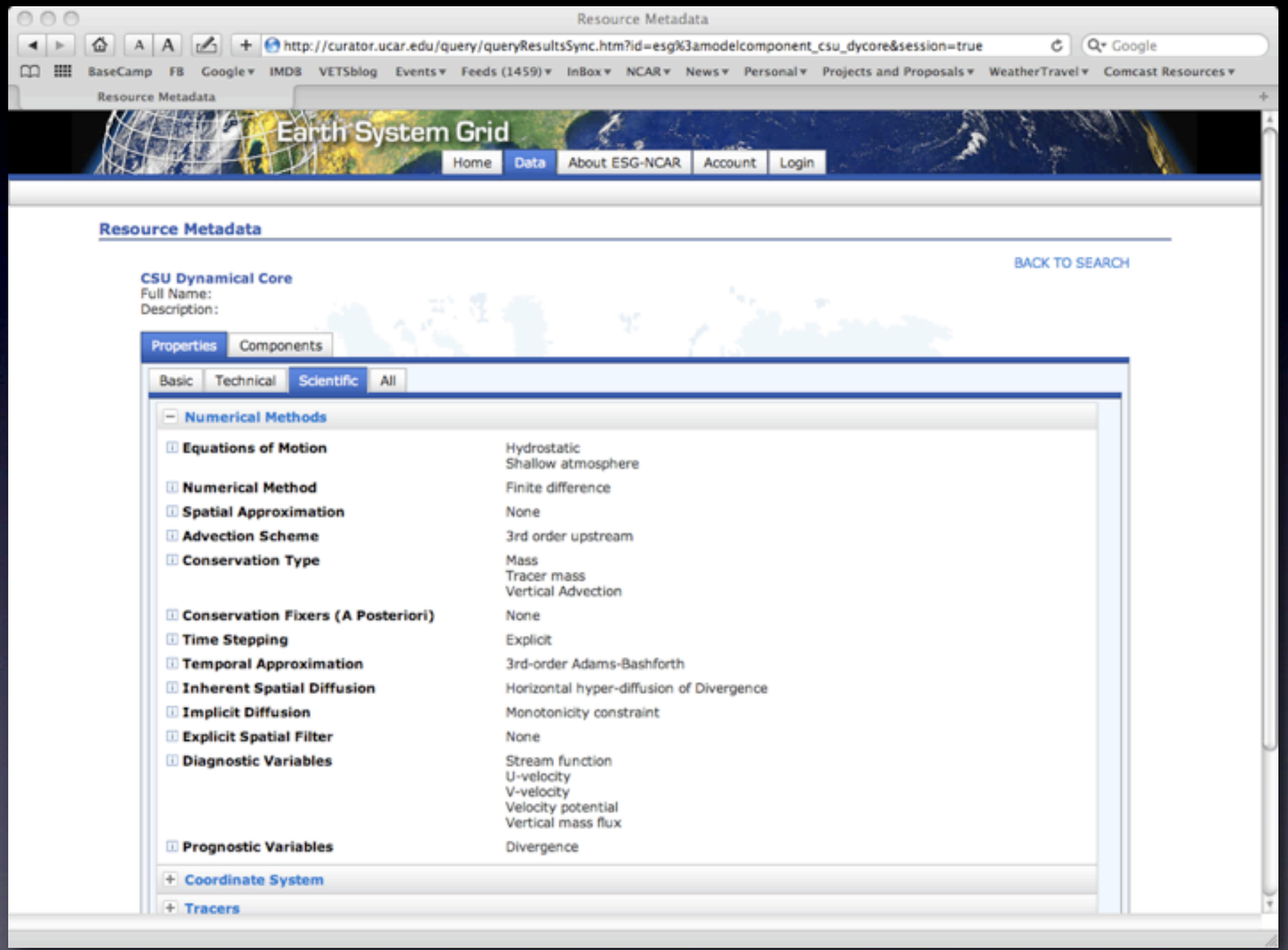
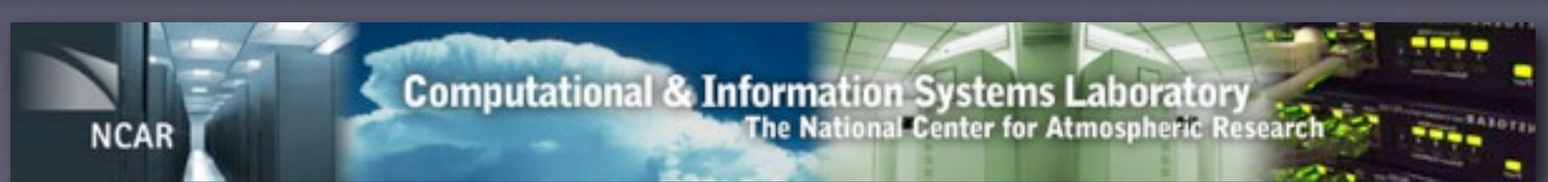
“Trackback” Interfaces





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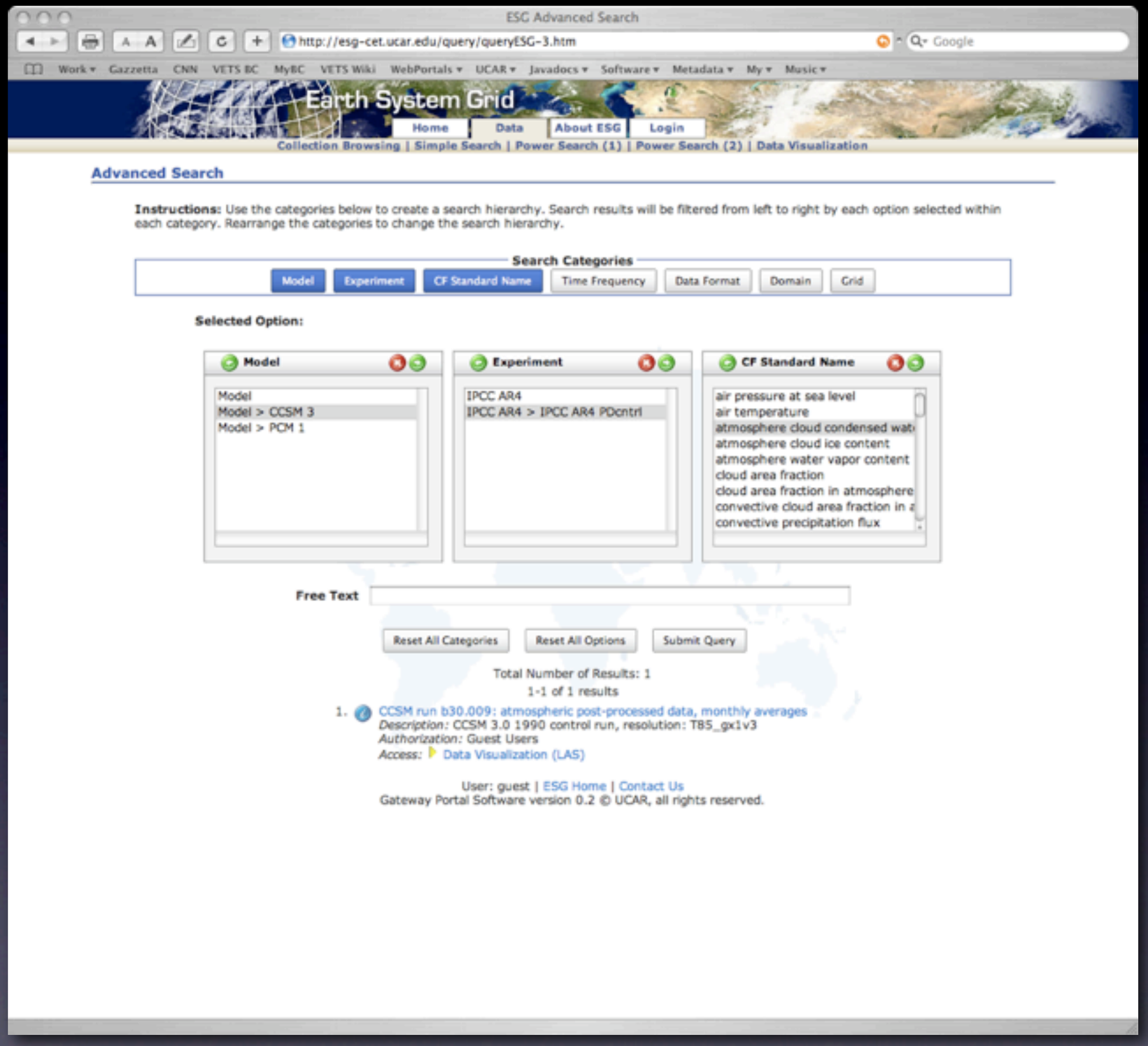
Semantic Integration



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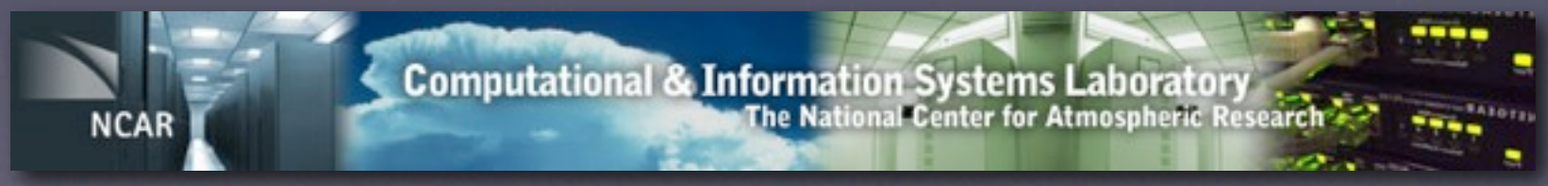
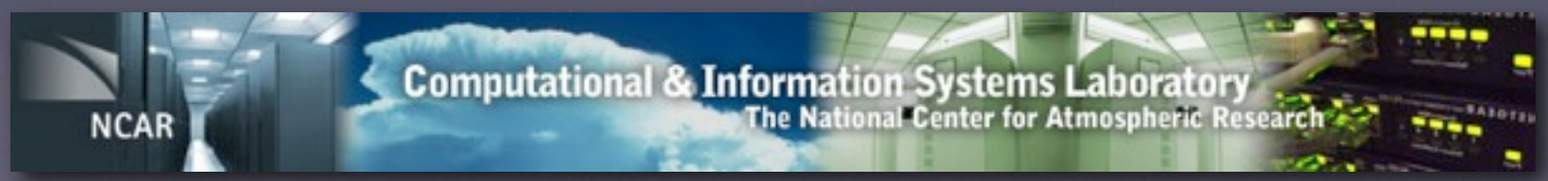


Some Focus Areas

- Continued collaboration across GIP, Curator, METAFOR, and ESG, in pursuit of CMIP5 objectives
- Dynamic comparison tables of model and component properties
- Building upon extremely rich metadata, exploit semantic capabilities
- User and group workspaces



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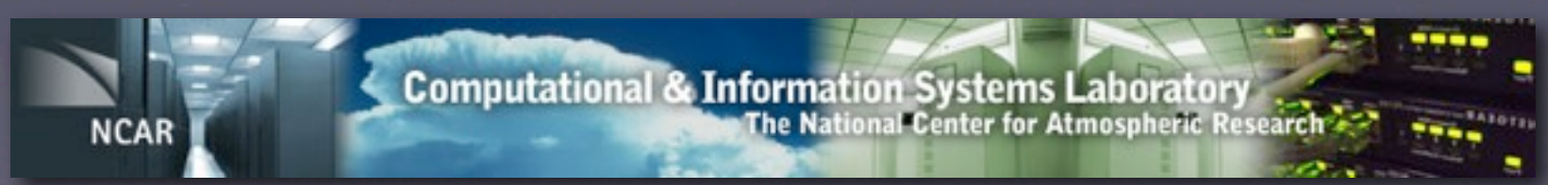
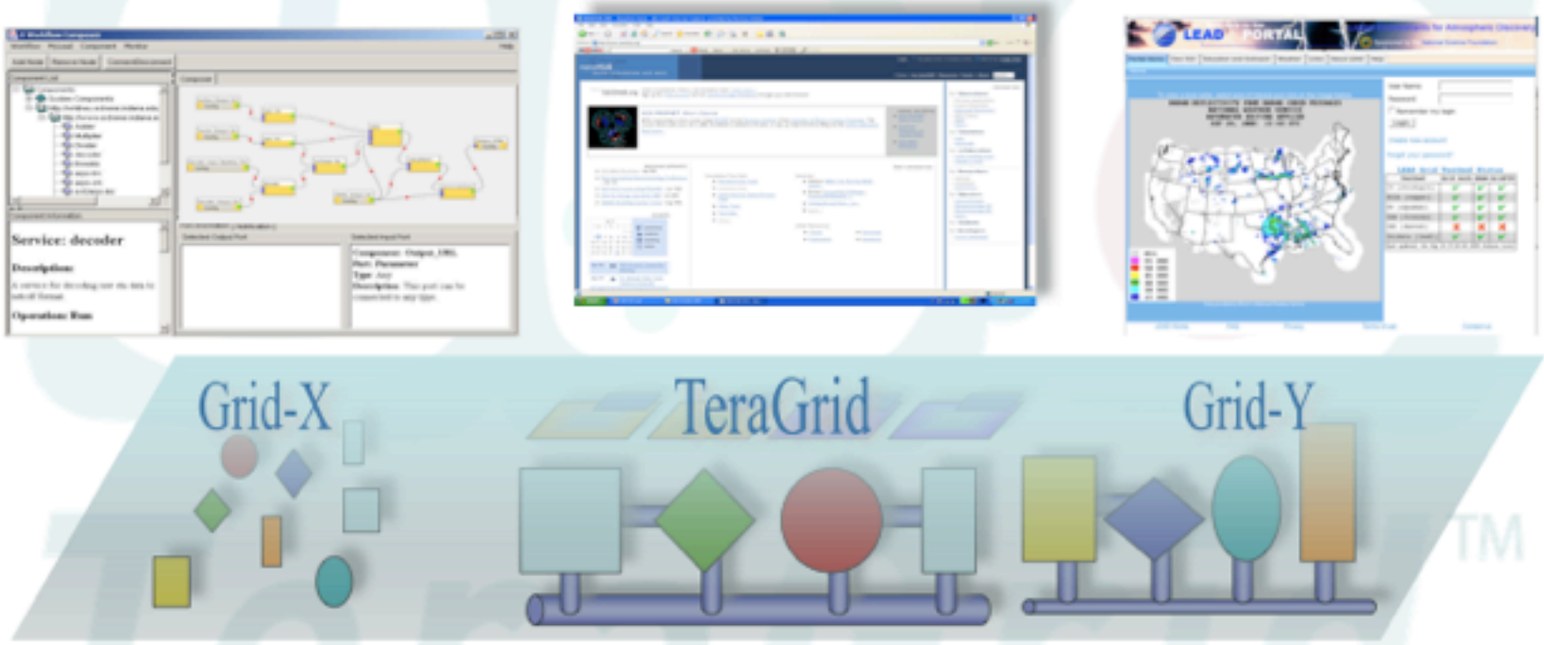
Model Execution Capabilities



Science Gateways

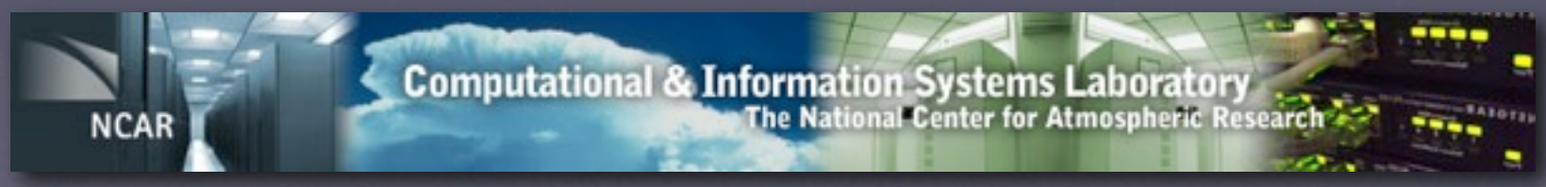
TeraGrid Science Gateways Initiative: Human Interface to Grids



- **Common Web Portal or application interfaces (database access, computation, workflow, etc).**
- **"Back-End" use of TeraGrid computation, information management, visualization, or other services.**
- **Standard approaches so that science gateways may readily access resources in any cooperating Grid without technical modification.**

Charlie Catlett (cec@uchicago.edu)

May 2006 TeraGrid



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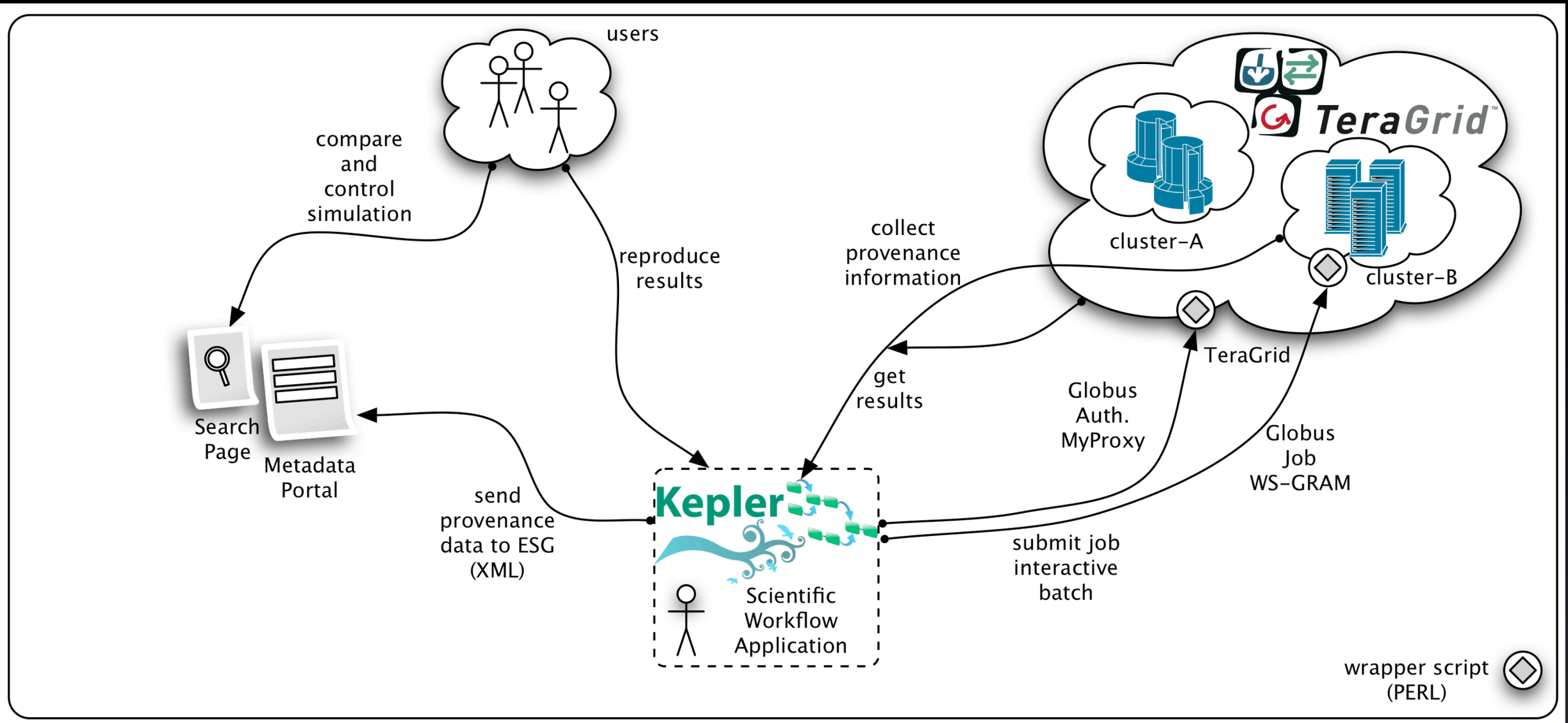
A Prototype CCSM Workflow on the TeraGrid



Material Courtesy of Ufuk Turuncoglu, Sylvia Murphy, and Cecelia DeLuca

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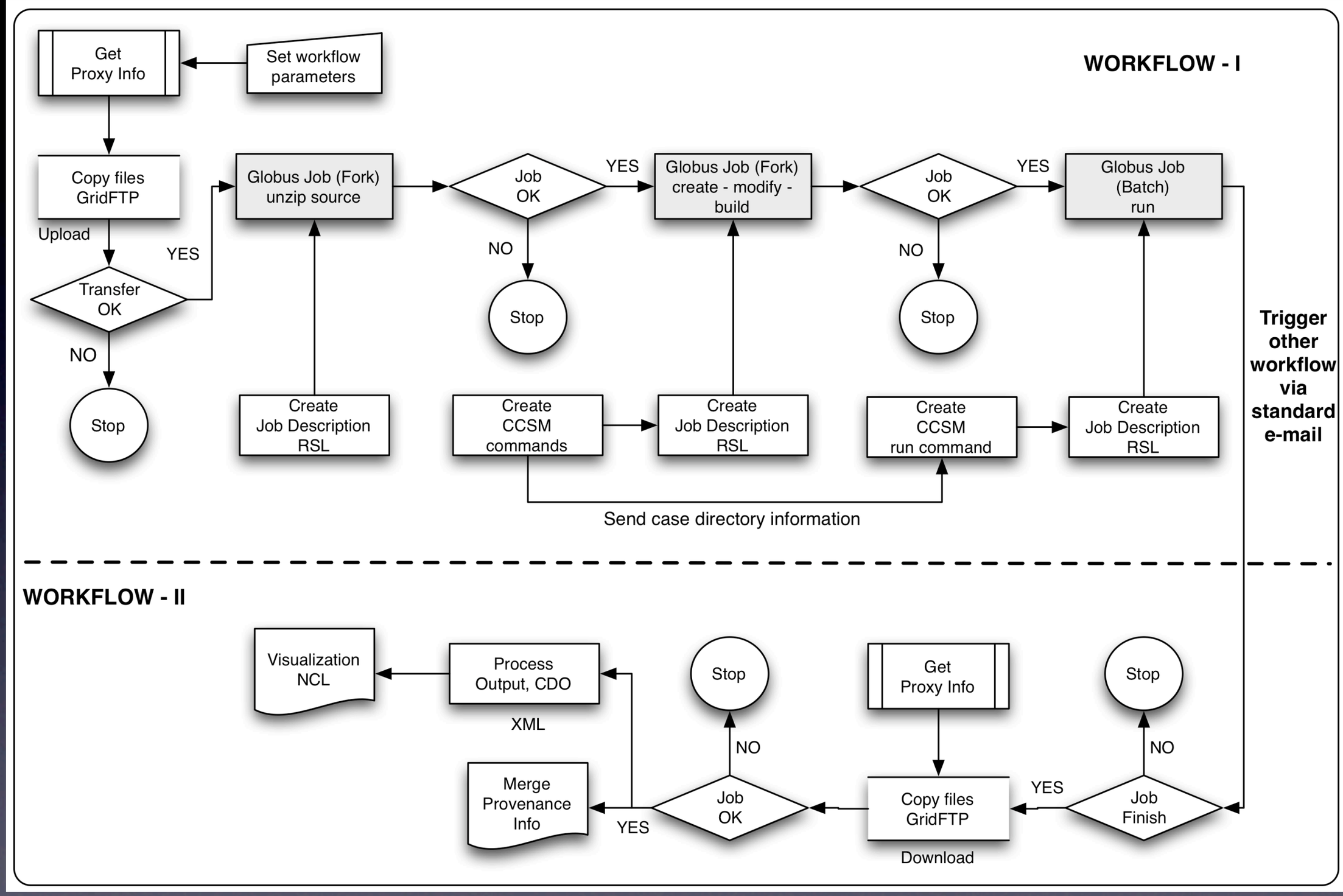
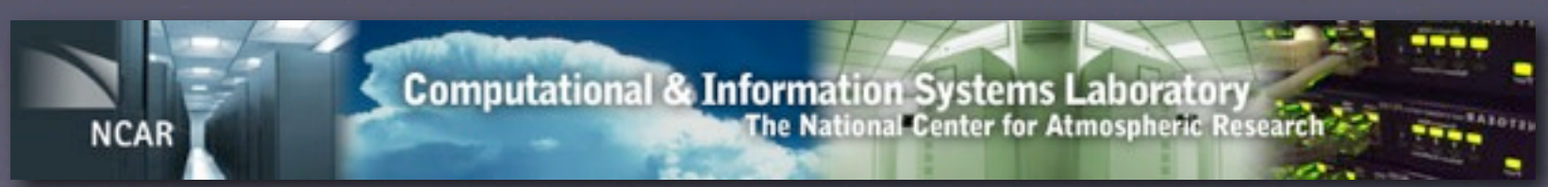

WORKFLOW - I
Get Proxy Info
Set workflow parameters
Copy files GridFTP
Upload
Transfer OK
YES
NO
Stop
Globus Job (Fork) unzip source
Create Job Description RSL
Job OK
YES
NO
Stop
Globus Job (Fork) create - modify - build
Create CCSM commands
Create Job Description RSL
Job OK
YES
NO
Stop
Globus Job (Batch) run
Create CCSM run command
Create Job Description RSL
Trigger other workflow via standard e-mail
Send case directory information
WORKFLOW - II
Visualization NCL
Process Output, CDO
XML
Merge Provenance Info
YES
Stop
NO
Job OK
Copy files GridFTP
Download
Get Proxy Info
YES
Stop
NO
Job Finish

Some Focus Areas

- Develop generalized multi-model workflows, addressing configuration, execution, and data/metadata publication
- Coordinate with the Analysis Workflows thrust in GIP
- Collaborate with the TeraGrid Science Gateways initiative and Purdue



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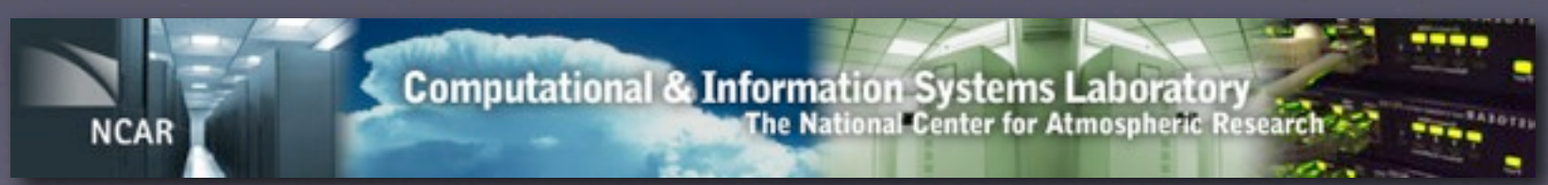
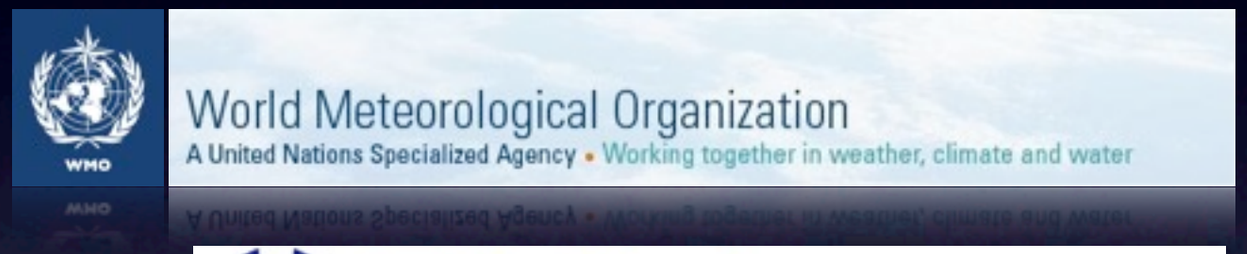
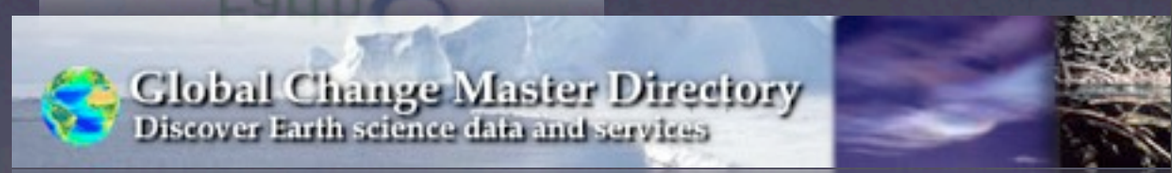
Future Possibilities

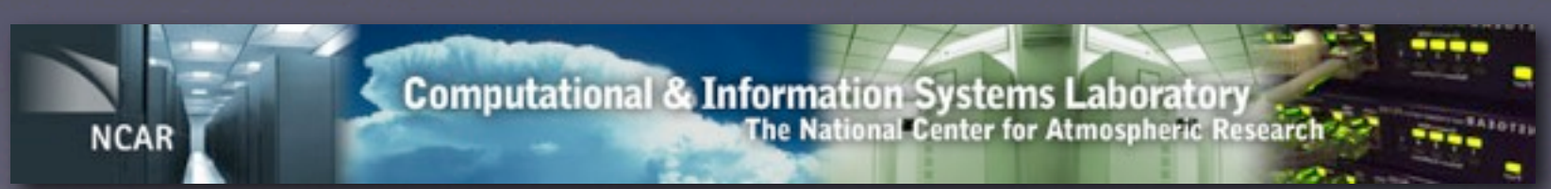


Towards Global Data Federation



Shared Cyberinfrastructure





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Open Access


Open Access to Scholarly Publishing?
• NIH open access policy ("the public paid for it, the public should get to see it")
• Cornyn-Lieberman bill (open access for all Federal agencies)
• Conyers bill (open access for no Federal agencies)
• Harvard, MIT, Stanford and BU and others have announced open access initiatives (published faculty research to be placed on their institutional repositories)

Knowledge in Publications

- Open Access Trends
- Citable Datasets
- Linking models, data, and knowledge from scholarly works

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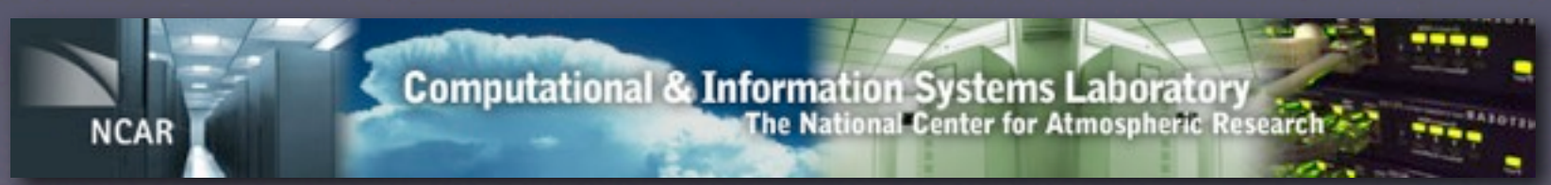
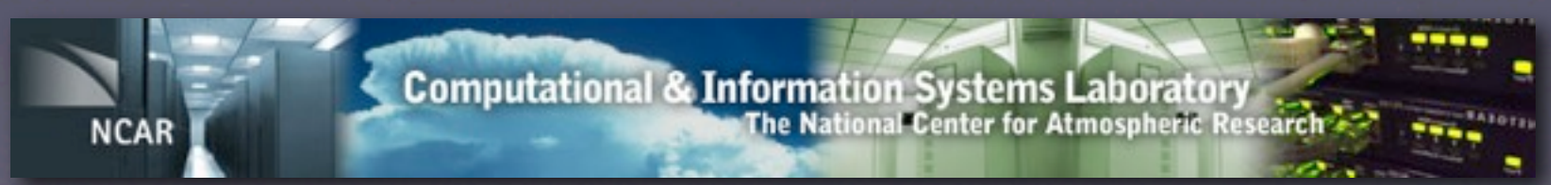


End

don@ucar.edu



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